

12th Iberian Gravitational Waves Meeting



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Where is the ringdown? Gravitational waves in scalar-tensor theories.

Monday 6 June 2022 17:05 (20 minutes)

We study the generation of gravitational waves in scalar-tensor gravity with 3+1 numerical relativity. We show that new scalar gravitational waves are excited, generated by the dilatonic part of the scalar field, which obeys a massive wave equation. Whilst tensor ringdown waveforms extracted at a distance from the source agree with those expected from quasinormal mode (QNM) calculations, the scalar mode shows a radically different behaviour, consisting of a non-exponentially decaying inverse chirp that crosses through the QNM frequency prediction. This is a consequence of the dispersive nature of the new (massive) scalar mode, which obscures the ringdown phase when mixing with louder transient responses of the collapse as it propagates. In order to alleviate the dispersion and classify the different stages of the collapse, we rewind the extracted signals evolving them back with a massive wave equation in flat space, which allows us to clearly identify the ringdown phase and extract the QNMs, in agreement with the expected values from perturbative calculations.

Which topic best fits your talk?

GW Theory and Fundamental Physics

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